

Mass Balance of the West Antarctic Ice-Sheet from ICESat Measurements

*H. Jay Zwally, Jun Li, John Robbins, Jack L. Saba, and Donghui Yi
Code 614.1 Cryospheric Sciences Branch
NASA Goddard Space Flight Center
Greenbelt, MD 20771 USA*

Mass balance estimates for 2003-2008 are derived from ICESat laser altimetry and compared with estimates for 1992-2002 derived from ERS radar altimetry. The net mass balance of 3 drainage systems (Pine Island, Thwaites/Smith, and the coast of Marie Bryd) for 2003-2008 is a loss of 100 Gt/yr, which increased from a loss of 70 Gt/yr for the earlier period. The DS including the Bindschadler and MacAyeal ice streams draining into the Ross Ice Shelf has a mass gain of 11 Gt/yr for 2003-2008, compared to an earlier loss of 7 Gt/yr. The DS including the Whillans and Kamb ice streams has a mass gain of 12 Gt/yr, including a significant thickening on the upper part of the Kamb DS, compared to a earlier gain of 6 Gt/yr (includes interpolation for a large portion of the DS). The other two DS discharging into the Ronne Ice Shelf and the northern Ellsworth Coast have a mass gain of 39 Gt/yr, compared to a gain of 4 Gt/yr for the earlier period. Overall, the increased losses of 30 Gt/yr in the Pine Island, Thwaites/Smith, and the coast of Marie Bryd DSs are exceeded by increased gains of 59 Gt/yr in the other 4 DS. Overall, the mass loss from the West Antarctic ice sheet has decreased to 38 Gt/yr from the earlier loss of 67 Gt/yr, reducing the contribution to sea level rise to 0.11 mm/yr from 0.19 mm/yr.